

### REMARKS

The claims have been amended to obviate the objections and to correct or cancel the claims rejected under 35 USC § 112. The objection to claims 2, 24 and 39; and the rejection of claims 13, 19, 21, 23 and 39 under 35 USC § 112 should be withdrawn. Non-elected claims 15-17 and 40 have been canceled without prejudice to filing a divisional patent application.

Claims 1-14, 18-23 and 25-38 stand rejected under 35 USC § 102(b) as anticipated by Barbee et al., U.S. Pat. No. 6,384,121 ('121).

Applicants have corrected the latest amendment by deleting reference to the matrix polymer and by amending the claims to clearly distinguish the claimed invention from the intercalates described in the '121 patent.

As disclosed in paragraph [0044] and original claim 20, applicants' intercalate is formed by intercalating an intercalant monomer, oligomer or polymer surface modifier that is a reaction product of at least one diamine and at least one dicarboxylic acid, **without prior sorption of an onium ion spacing agent**.

Applicants have found that a layered silicated material can be intercalated by ion-exchange with a protonated amine group of the claimed reaction product without prior sorption of an onium ion spacing agent, thereby providing unexpected thermal stability to the claimed intercalates:

**[0002]** ...“The protonated amine functionalities on the intercalant molecules are bonded on the inner surface of the phyllosilicate platelets and bonded to the platelet surfaces at the negative charge sites of the platelet surfaces to form columns of the intercalant molecules that extend upwardly, away from the platelet surfaces to provide surprisingly large basal spacing(s) between adjacent phyllosilicate platelets with relatively few intercalant molecules.

**[0003]** The intercalated oligomers form a unique type of intercalate and exfoliate that provides unexpected thermal stability to the intercalates, exfoliates, and the nanocomposite compositions in which they are dispersed.

**[0102]** The excellent thermal stability of the intercalates and exfoliates and nanocomposite compositions described herein enable the intercalates and exfoliates to be incorporated into matrix

polymers having very high melting points, *e.g.*, m.p.> 260°C. Polycarbonate, PET and others are in this high melting point category. The incorporation method preferably will be melt compounding.”

The intercalates of the ‘121 patent require pre-treatment of the layered phyllosilicate material with organic cations, preferably an ammonium compound, to effect partial or complete cation exchange (col. 11, lines 10-13). The list of onium ion pre-treating compounds is set forth at col. 11, line 19 to col. 12, line 11.

Applicants have found that onium ion intercalation for the purpose of expanding the d-spacing of adjacent phyllosilicate platelets, while allowing for easier intercalation of monomer, oligomer or polymer intercalants, as claimed in the ‘121 patent, results in thermal instability at about 220 °C, where the intercalated Barbee ion-exchanged onium ions thermally decompose.

By intercalating the protonated diamine and dicarboxylic acid reaction product, particularly as an oligomer, without prior sorption of the onium ion spacing agent, the polyamide can be melt processed at the required 260-280 °C processing temperatures without the thermal decomposition that always results from the onium ion pre-treatment process described in the ‘121 patent.

As shown in the enclosed Declaration Under 37 CFR § 1.132, the previously employed intercalants, commonly onium ion surfactants *e.g.*, octadecyl ammonium, are thermally unstable during the processing of polyamide matrices. This inherent thermal instability leads to the production through pyrolysis and/or thermal decomposition of chemicals that are incompatible with the desired final polyamide product. The example provided in the Declaration, wherein pyrolysis products and/or thermal decomposition products are unacceptable, was of Nylon resins in contact with food stuffs but the general principle that pyrolysis products are undesirable in final products is clear. These pyrolysis products often have noxious smells and can impair the utility of the final product.

Though the ‘121 patent does not describe the odor, color, or the composition of the prepared polyamide product, the inclusion of pyrolysis products and/or thermal decomposition products from the octadecyl ammonium intercalant is expected. Based on the data presented in the Declaration the pyrolysis and/or thermal decomposition of the onium

intercalant is inherent to onium ion surfactants, and the high thermal stability of the BAB and BABAB intercalated phyllosilicates was both unexpected and industrially beneficial.

Since the '121 patent neither discloses nor suggests omitting the organic cations in the process of forming the intercalate, it is submitted that the rejection of claims 1-14, 18-23 and 25-38 under 35 USC § 102(b) should be withdrawn.

Claims 1-12 and 20-39 stand rejected under 35 USC § 102(b) as anticipated by, or in the alternative under 35 USC § 103(a) as obvious over Lan et al. U.S. Pat. No. 6,232,388 ('388). Like the '121 patent, the '388 patent intercalates the clay with a typical quaternary ammonium compound, such as octadecylammonium ions. Therefore, for the reasons set forth above with respect to the '121 patent, it is submitted that the rejections of claims 1-12 and 20-39 under 35 USC § 102(b) should be withdrawn.

Claims 24 and 39 stand rejected under 35 USC § 103(a) as being unpatentable over the '121 patent. Applicants have found, as recited in the Declaration, that compositions recited in the '121 patent are thermally unstable at the processing temperatures taught by the '121 patent. The '121 patent neither expressly nor inherently teaches one of ordinary skill how to provide a polyamide matrix composition that does not suffer from pyrolysis and/or thermal decomposition during the processing of the matrix.

Moreover, the '121 patent neither expressly nor inherently suggests that products devoid of the thermally unstable onium ion intercalants can be successfully combined to produce the compositions made by the Applicants. In fact, the '121 patent generally teaches that it is desirable to pre-treat the selected clay materials with onium ion surfactants to facilitate the incorporation of the platelets into the polymer. See col. 10 lines 61 - col. 12 line 37. Therefore, for these reasons and those set forth above, it is submitted that the rejections of claims 24 and 39 under 35 USC § 103(a) should be withdrawn.

Claims 13 and 14 stand rejected under 35 USC § 103(a) as being unpatentable over Okada et al. 4,894,411 ('411). For the reasons set forth above with respect to the '121 and '388 patents, it is submitted that the rejections of claims 13 and 14 under 35 USC § 103 should be withdrawn.

An earnest attempt has been made to respond to all objections and rejections set forth in the outstanding office action. Early and favorable consideration is respectfully requested.

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Respectfully submitted,

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